STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
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AQUIFER (PUMP) TEST PROCEDURES

This cover sheet provides a helpful reference to the procedures specified in the Hawaii Well Constructions and Pump Installation Standards (February 2004). The pump test procedure for new wells shall consists of:

1) A Step-Drawdown Test (for proposed permanent pump capacity ≥ 70 gpm) to assess individual well performance with regard to yield and sensitivity to chloride changes and nearby aquifer properties followed by:

2) A Constant-Rate Test (for proposed permanent pump capacity > 50 gpm) to further assess nearby hydraulic properties of the aquifer

Please refer to the Hawaii Well Constructions and Pump Installation Standards for more detailed instruction and discussion of required pump test procedures.

General Recording Requirements

The records required for analysis and the tolerance in measurement acceptable for the step-drawdown and long-term continuous aquifer test are as follows:

1. The rate of pumping shall be maintained within ± 30 gpm or ± 10 percent of the designated rate, whichever is less.

2. Depth to water measurements in the pumped well shall be accurate to 0.10 feet.

3. Time shall be accurate to within 1 minute.

4. Water discharged from the well during the step-drawdown and long-term test shall be carried away from the well to a distance sufficient to preclude circulation of the discharge water downward to the ground-water table.

5. Recording of data should be on forms provided by the CWRM or copy thereof. In addition, data shall be plotted on a log-log graph (3x5 cycle).

Step-Drawdown Test

The easiest way to ensure compliance is to follow the attached SDPTD form (10/25/2004) that has been designed in accordance with the Hawaii Well Construction and Pump Installation Standards. The purpose of the step-drawdown test is to establish the efficiency of the well and to provide preliminary information on the yield of the well, both from a quantity and quality standpoint.

1. Measurement of water level in the pumped well shall be made at 15-minute intervals for 45 minutes prior to the initiation of the step-drawdown test in order to obtain the pretest static water level.

2. The step-drawdown test will consist of continuously pumping the well at progressively increasing fractions of the proposed discharge at a minimum of 3 rates.

    a. The minimum length of time for each discharge rate shall be ½ hour and dependent on the occurrence of an observable change in water level in the well from the previous pumpage rate.

    b. The test shall begin with the lowest pumping rate and conclude with the highest rate.

3. As a minimum, a water sample taken at the end of the test shall be tested for chloride content.

Constant-Rate Test

The easiest way to ensure compliance is to follow the attached CRPTD form (10/25/2004) that has been designed in accordance with the Hawaii Well Construction and Pump Installation Standards. The purpose of the long-term continuous test is to determine the hydraulic properties of the aquifer to explore for and identify nearby hydrologic boundaries such as streams or dikes and to observe the trend in chloride concentration of the discharge water.

1. The long-term test should not commence until the water level in the pumped well has fully recovered from the step-drawdown test. The static water level in the pumped well shall be measured at 15-minute intervals for 45 minutes.

2. The pump rate for the long-term test shall be an amount as determined by the step-drawdown test or equal to the proposed pump capacity.

3. The test should be run in accordance with Table 9 in the Hawaii Well Construction and Pump Installation Standards.

4. Measurement of chloride concentration and temperature of the discharge water during the long-term test shall be made at the beginning of the test and every six hours thereafter.

5. Depth to water in all wells shall be measured at intervals of 10 minutes or less during the first 2 hours of pumping, at intervals of 1 hour or less to the 24th hour, and at an interval of 2 hours or less for the remainder of the required test period.

6. A sufficient number of water level measurements shall be made in the pumped well following termination of the long-term continuous test to establish that the water level fully recovers from each test to pretest levels. Immediately upon termination of the test, the depth to water in the pumped well shall be measured at a frequency that corresponds to the pattern required during the pumping period and for such a period of time required for the water level in the well to recover to within 80% of the water level observed at the beginning of the test.

STEP-DRAWDOWN PUMP TEST DATA

(not required for wells producing < 100,000 gpd or 70 gpm)

Pumped Well No. _____ Observation Well No. _____

Pumped Well Name _____ Distance between Obs. & Pumped Well _____ ft.

Target Q _____ gpm Reference pt. for depth to water _____ ft. msl

Static Water Level @ start of test _____ ft. msl

Water level measurements by: ☐ electrical sounder ☐ pressure transducer ☐ airline

START TEST Date: _____ Time of day: _____

Flow Meter Reading Start: _____ gallons

Suggested Elapsed time **t** (min)	Actual Elapsed Time **t** (min)	Depth to water (nearest 0.1 ft)	Drawdown **S** (unadjusted to nearest 0.1 ft)	Pumping rate **Q** (at least 3 steps) (gpm)	**EC** (μmhos)	**Cl^-** (mg/l)	Temp. ___° F or ___° C	Data in this table is for: ☐ Pumped Well ☐ Observation Well Remarks
-45				0			.	**Start test/ Step 1**
-30				0			.	
-15				0			.	
0				[1]			.	**Start pump**
1							.	
1.5							.	
2							.	
2.5							.	
3							.	
4							.	
5							.	
6							.	
7							.	
8							.	
10							.	
15							.	
20							.	
25							.	
30[2]						[3]	.	**Chloride sample taken**
							.	**Step 2 begin?**
							.	
							.	

Suggested Elapsed time **t** (min)	Actual Elapsed Time **t** (min)	Depth to water (nearest 0.1 ft)	Drawdown **S** (unadjusted to nearest 0.1 ft)	Pumping rate **Q** (at least 3 steps) (gpm)	**EC** (µmhos)	**Cl⁻** (mg/l)	Temp. ___° F or ___° C	Data in this table is for: ☐ Pumped Well ☐ Observation Well Remarks
							.	
							.	
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Suggested Elapsed time **t** (min)	Actual Elapsed Time **t** (min)	Depth to water (nearest 0.1 ft)	Drawdown **S** (unadjusted to nearest 0.1 ft)	Pumping rate **Q** (at least 3 steps) (gpm)	**EC** (μmhos)	**Cl^-** (mg/l)	Temp. ___° F or ___° C	Data in this table is for: ☐ Pumped Well ☐ Observation Well Remarks
							.	
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							.	
							.	
							.	
							.	
								Max possible duration, water level or quality did not stabilize for any 24 period
			[4]	0				**Begin recovery data next page** Flow meter reading at end of pumped period: _____ gals

[1] starting pumping rate Q
[2] minimum length of step period of constant pumping rate
[3] minimum mandatory Chloride (Cl^-) measurement/sampling at end of every step
[4] Use same ending drawdown figure as start for recovery

Suggested elapsed time **t** (min)	Actual elapsed time **t** (min)	Depth To Water (nearest 0.1 ft)	Recovery Drawdown **S** (unadjusted to nearest 0.1 ft)	Pumping rate **Q** (gpm)	**EC** (μmhos)	**Cl^-** mg/l)	Temp. ___ ° F or ___ ° C	Data in this table is for: ☐ Pumped Well ☐ Observation Well Remarks
0	0			0			.	**Pump off, start recovery**
1				0			.	
1.5				0			.	
2				0			.	
2.5				0			.	
3				0			.	
4				0			.	
5				0			.	
6				0			.	
7				0			.	
8				0			.	
10				0			.	
15				0			.	
20				0			.	
25				0			.	
30				0			.	
40				0			.	
50				0			.	
60				0			.	
70				0			.	
80				0			.	
90				0			.	
100				0			.	
150				0			.	
200				0			.	
250				0			.	☐ 80% recovery achieved ☐ 80% recovery not achieved

END TEST Date: _____ Time of day: _____

ADDITIONAL REMARKS: _____

Person in charge of pump test (print): _____

Signature:_____

The signature above indicates that the data reported on this form is accurate and true to the best of the person's knowledge who operated this pump test.

CONSTANT-RATE PUMP TEST DATA

(not required for wells producing < 50 gpm)

Pumped Well No. _____ Observation Well No. _____

Pumped Well Name _____ Distance between Obs. & Pumped Well _____ ft.

Target Q _____ gpm Reference pt. for depth to water _____ ft. msl

Static Water Level @ start of test _____ ft. msl

Water level measurements by: ☐ electrical sounder ☐ pressure transducer ☐ airline

START TEST Date:_____ Time of day:_____

Flow Meter Reading Start:_____ gallons

Suggested elapsed time **t** (min)	Actual elapsed time **t** (min)	Depth to water (nearest 0.1 ft)	Drawdown **S** (unadjusted to nearest 0.1 ft)	Pumping rate **Q** (gpm)	**EC** (μmhos)	**Cl^-** (mg/l)	Temp. ___° F or ___° C	Data in this table is for: ☐ Pumped Well ☐ Observation Well Remarks
-45								**Start test**
-30								
-15								
0	0		0.00			[1]	.	**Start pump/Cl^- taken**
1							.	
1.5							.	
2							.	
2.5							.	
3							.	
4							.	
5							.	
6							.	
7							.	
8							.	
10							.	
15							.	
20							.	
25							.	
30							.	
40							.	
50							.	
60							.	

Suggested elapsed time **t** (min)	Actual elapsed time **t** (min)	Depth to water (nearest 0.1 ft)	Drawdown **S** (unadjusted to nearest 0.1 ft)	Pumping rate **Q** (gpm)	**EC** (μmhos)	**Cl⁻** (mg/l)	Temp. ___° F or ___° C	Data in this table is for: ☐ Pumped Well ☐ Observation Well Remarks
70							.	
80							.	
90							.	
100							.	
150							.	
200							.	
250							.	
300							.	
400						[1]	.	**Cl⁻ sample taken**
500							.	
600							.	
700							.	
800						[1]	.	**Cl⁻ sample taken**
900							.	
1000						[1]	.	**Cl⁻ sample taken**
1500						[1]	.	**Cl⁻ sample taken**
2000						[1]	.	**Cl⁻ sample taken**
2500						[1]	.	**Cl⁻ sample taken**
3000						[1]	.	**Cl⁻ sample taken**
4000						[1]	.	**Cl⁻ sample taken**
5000						[1]	.	**Cl⁻ sample taken**
6000						[1]	.	**Cl⁻ sample taken**
7000						[1]	.	**Cl⁻ sample taken**
8000						[1]	.	**Cl⁻ sample taken**
9000						[1]	.	**Cl⁻ sample taken**
10000								**Max possible duration**, water level or quality did not stabilize for any 24 period
			[2]	0				**Begin recovery data next page** Flow meter reading at end of pumped period: _____ gals

[1] Chloride sampling required

[2] Use same ending drawdown figure as start for recovery

Suggested elapsed time **t** (min)	Actual elapsed time **t** (min)	Depth to water (nearest 0.1 ft)	Recovery Drawdown **S** (unadjusted to nearest 0.1 ft)	Pumping rate **Q** (gpm)	**EC** (μmhos)	**Cl^-** (mg/l)	Temp. ___° F or ___° C	Data in this table is for: ☐ Pumped Well ☐ Observation Well Remarks
0	0			0			.	**Start recovery**
1				0			.	
1.5				0			.	
2				0			.	
2.5				0			.	
3				0			.	
4				0			.	
5				0			.	
6				0			.	
7				0			.	
8				0			.	
10				0			.	
15				0			.	
20				0			.	
25				0			.	
30				0			.	
40				0			.	
50				0			.	
60				0			.	
70				0			.	
80				0			.	
90				0			.	
100				0			.	
150				0			.	
200				0			.	
250				0			.	☐ 80% recovery achieved ☐ 80% recovery not achieved

END TEST Date: _____ Time of day: _____

ADDITIONAL REMARKS: _____

Person in charge of pump test (print): _____

Signature:_____

The signature above indicates that the data reported on this form is accurate and true to the best of the person's knowledge who operated this pump test.

Graph 1